

THE USE OF X-RAYS IN CARCINOMA.¹

BY WILLIAM ALLEN PUSEY, M.D.,
OF CHICAGO.

IN considering the use of X-rays in carcinoma, it would seem to be conducive to clearness first to determine the demonstrable facts concerning the influence of X-rays on carcinoma tissue, and then, in the light of these, to consider clinical findings. In this way I shall, as briefly as possible, take up the subject. I shall consider only my own work, because I can only speak with responsibility of it.

In the first place, it can be demonstrated that X-rays are capable of destroying carcinoma tissue on the surface of the body. This is shown by the behavior of cutaneous carcinomas or epitheliomas which are properly exposed to the influence of X-rays. In my experience, the type of epithelioma has made little difference in the result; all forms may be destroyed with about equal readiness by X-rays. By this I do not mean to say that all lesions yield with equal readiness. On the contrary, I see great variability in the resistance of these lesions. But, so far as I am able to determine, this is not so much a variation in the susceptibility of different types of epithelioma, as it is a variation in susceptibility of all of the tissue of different individuals; for, in the cases that are resistant, the surrounding healthy tissues seem to have as great relative tolerance as the diseased tissues. I have not been able to determine anything in the character of different types of epithelioma which enables me to predict whether a given lesion will be relatively susceptible or relatively insusceptible. But there is room for difference of opinion upon this point, and I am not ready to dogmatize upon it. The point that I wish to emphasize is that carcinoma tissue upon the surface can with practically invari-

¹ Read before the Chicago Surgical Society, June 7, 1905.

ing regularity be destroyed with X-rays, and be replaced by healthy scar tissue.

When we come to carcinomas more deeply situated, we are not in possession of many authentic facts; but I have two cases from which I can furnish definite post-mortem data. These two cases were primary carcinomas of the breast. One of these, an old woman referred to me by Dr. Wyllys Andrews, had a large primary carcinoma of the breast without involvement of the skin, with enlarged axillary glands, and with spinal metastasis when the treatment was begun. The patient had vigorous X-ray exposures lasting about a month, with the production of a dermatitis which subsided completely before her death, about three months after the treatment began. Post-mortem, it was found that the breast was a mass of connective tissue without any carcinoma tissue remaining. The same was true of the axillary contents; they were converted into a mass of connective tissue without the remains of carcinoma. In the second case, an old woman referred to me by Dr. J. B. Murphy, there was a large primary carcinoma of the breast without involvement of the skin and with enlargement of the axillary glands. She had vigorous treatment for six weeks, with the production of only a mild reaction. About three months after I first saw her she developed an acute gastritis, from which she died. Post-mortem, it was found by Dr. W. A. Evans that the tumor of the breast had been converted into a small fibrous mass about the diameter of and two-thirds the length of an index-finger. In other words, the carcinoma had been destroyed, and there remained in its place a small mass of scar tissue. In this case the axillary glands had not been affected. The difference in the findings in these two cases, in my opinion, depends upon the fact that in the first case the axilla had been sufficiently exposed, and in the second it had not. In these two cases, then, we had carcinoma tissue beneath skin and fat destroyed without destruction of the overlying tissues.

The foregoing are definite data which I can present as to the effects of X-rays upon carcinoma. How far are these applicable in the treatment of carcinoma? As far as epithelioma

is concerned, the subject can be very briefly stated. I believe it may be said almost without reservation that any epithelioma which has not metastases, and which has not deeply involved the subcutaneous tissue, may be symptomatically cured by X-rays. By symptomatically cured, I mean to say converted into healthy scar tissue, as healthy scar tissue as can be gotten after the excision of epithelioma. The superficial extent of the carcinomas is, of course, a factor of some consideration in the prognosis; but the most extensive epitheliomas that I have seen I have symptomatically cured with X-rays. I have seen lesions involving areas of 30 to 40 or 50 square inches converted into healthy scar tissue. Where there is deep involvement of the subcutaneous tissues, as in epitheliomas invading the orbit or extending down deep into the bones of the face, X-rays may fail; but I have seen unexpectedly successful results in cases of this sort, as, for example, in epitheliomas involving the bones of the nose. Where there are metastases in the contiguous glands X-rays usually fail, but here likewise at times we have successful results.

As to the permanence of the results in epithelioma, some of my cases have gone now more than three years without recurrence; and I believe that whenever you are able to get a satisfactory scar you may count upon a permanent result. As regards permanency of results, I believe the cases will bear a fair comparison with those treated by any other method. As to the range of application of X-rays in epithelioma, it may, in my opinion, be said that any case of epithelioma is suitable for treatment with X-rays in which, if a surgeon were operating, he would not feel called upon to remove the contiguous glands. If the case is one in which the removal of the contiguous glands is indicated, it should be treated surgically, and not with X-rays. That statement, I trust, covers the question of the treatment of epitheliomas of the lip with X-rays.

But, excepting epitheliomas, what can be done for carcinoma by the use of X-rays? Are the post-mortem findings, which I have reported in the two breast cases above, corroborated by any practical results in the treatment of subcuta-

neous carcinomas? Can any symptomatic cures be shown in unquestionable cases of synchronous carcinoma? Or can any unquestionable cases of carcinomas, other than epitheliomas, be shown which have remained well for the three-year period? I have some cases, authenticated by unquestionable authorities, which answer these questions in the affirmative. For example, in September, 1901, Dr. A. J. Ochsner referred to me a woman of about forty with the second recurrence of carcinoma in the chest wall. The breast had been removed by one of our most prominent surgeons; there was recurrence in the chest wall, which he removed, and a second recurrence soon after developed, for which the patient consulted Dr. Ochsner, who thought that further operation offered no hope, and referred her to me. She had then two ulcers in the scar, each the size of a fifty-cent piece, and they were surrounded by indurated nodular borders, and adherent to the ribs. This patient was symptomatically well by January, 1902, and she has remained well and been able to pursue a hard vocation ever since. Here is a case, then, which had had two recurrences and was regarded as hopeless by Dr. Ochsner, that has remained well for over three years. The following case, although it has not been well so long, is far more significant, because of the involvement of the supraclavicular glands. This patient, a woman of forty-six, referred to me by Dr. G. H. Brannon, of Manhattan, Ill., had had the left breast removed for carcinoma in September, 1901. When she was referred to me in April, 1902, there was a healthy scar attached to the ribs, but in the axilla there was a mass of fused hard glands, and another large mass in the supraclavicular space, which caused a very perceptible swelling above the clavicle. The arm was cedematous. The general condition of the patient was much reduced. Operation was out of the question. This patient had X-ray exposures at intervals extending over about two years, and has been under constant observation up to the present. Within four months after beginning treatment, the masses above the clavicle and in the axilla were reduced until they felt like small masses of scar tissue, and the swelling of the arm quite disappeared.

These palpable masses in the supraclavicular space and axilla remained, and I had about concluded that they were scar tissue and could not be made to disappear, when, much to my delight, after a series of exposures about a year ago they entirely disappeared. Here is a patient, then, with carcinoma in the supraclavicular space and in the axilla, well on the down grade three years ago, who regained her usual vigor within six months, and three years after beginning her exposures is in her normal, fairly vigorous health, and is symptomatically cured. Other similar cases could be reported, showing that these cases are not accidental. I have seen the same sort of disappearance in carcinoma masses in primary carcinoma of the breast and the same sort of symptomatic cures that have remained permanent to the present time.

The following case shows that something can be done in more inaccessible locations.

In April, 1904, Mrs. —, about thirty-five, was referred to me by Dr. Sylvan Kunz. Six months previous the uterus and ovaries had been removed by Dr. Kunz for carcinoma. New nodules very soon appeared in the scar and, in spite of assiduous treatment in the usual ways, grew very rapidly. In April, 1904, there was a large nodular mass at the site of the scar in the vagina, larger than could be taken in by a Ferguson speculum. The patient's general condition was good. In four weeks under X-ray exposures, given directly per vaginam, this tumor had entirely disappeared, leaving no trace; discharge and hemorrhage permanently ceased; and for a year now there has been no suspicion of recurrence. As far as the patient knows, she is perfectly well. Her physical condition is as good as it ever was.

From these cases we naturally pass to carcinomas within the cavities of the body, and upon this subject I can offer nothing that is definite. I have treated many cases of pelvic carcinoma and a good many of carcinoma in the abdomen and thorax. In many of these cases there has seemed to be very considerable amelioration in the condition, but in none has the result amounted to more than amelioration.

In the light of such findings, what is a reasonable attitude towards the use of X-rays in carcinoma? It is, it seems to me, that X-rays are entitled to consideration in all cases of carcinoma, excepting only those which are amenable to surgical treatment, and those in which the disease has already extended so widely that it is manifestly impossible to hope for benefit from any remedy which is not capable of selectively destroying carcinoma tissue, no matter where situated in the body. X-rays do not and cannot rise to such requirements; and doubtless no remedy ever will until some specific agent is found which is capable of causing the solution of carcinoma masses in the body in the way that potassium iodide, for example, causes the disappearance of syphilitic gummata.

In the foregoing statement, the inoperable cases which I mean to exclude from any hope of radical relief from X-ray treatment are the deep-seated cases in the cavities of the body in which widespread metastases have already occurred. In such cases as these, as, for example, in carcinoma of the mediastinum or of the abdomen, I believe it is impossible, without some improvement in our technique which I cannot foresee, that X-rays can hold out any prospect of a radical result. But I believe that something can be done even in these cases. We are all familiar with the way the spleen in leukaemia can be hounded out of existence with X-rays without damaging the overlying skin. In the same way I have seen large masses of glands of Hodgkin's disease disappear from the mediastinum under X-ray exposures; and I have seen the same thing happen with similar masses of glands in the pelvis, so large that they rose above the brim of the pelvis and produced great oedema of the leg. If these things can be done with X-rays, it is not impossible to suppose that some effect can be produced upon masses of carcinoma tissue similarly situated; and if the cases of this sort treated with X-rays which I have observed indicate anything, they bear out this supposition. The patients improve, their condition is apparently distinctly ameliorated, and the course of their tumors considerably retarded. This much can, I believe, often be done even in the hopeless cases of carcinoma in the cavities of the body.

In all of the foregoing I have suggested that operation is preferable to the use of X-rays in operable carcinoma. From this I would except epithelioma. I am ready to maintain that the results in epitheliomas treated with X-rays are as radical as those treated by operation, excepting always epitheliomas where the contiguous glands should be removed. And there are certain features of the treatment of epitheliomas with X-rays, such as the freedom from pain for the patient, the more satisfactory character of the scars, and the greater range of usefulness, which, in my opinion, entitles X-rays to be regarded as the preferable method of treatment of most epitheliomas.

In advocating the use of X-rays in the treatment of epitheliomas, and in the treatment of inoperable carcinomas, consideration should be given to the question first, "Is the danger of metastases in epitheliomas increased by the use of X-rays?" and, second, "Is there danger of stimulating and rendering more rapid the growth in inoperable carcinoma by the use of X-rays?" I believe that both questions can be positively answered in the negative. In the first place, the histological findings are not such as lend plausibility to the first of these questions. In carcinoma tissue exposed to X-rays there is not first a stimulation of the growth; on the contrary, the first thing that is noted is a degeneration and a disintegration of the youngest peripheral cells. The vitality of the cells is lowered, their nuclei are converted into fragments, the protoplasm degenerates, and stains poorly; the whole process is one of disintegration rather than of even temporary stimulation of the carcinoma cells. If there is an organism of carcinoma in these cells, it might be liberated in this process; but certainly any organism which might be so liberated would have already had the opportunity of invading other tissues; and the whole course of carcinoma shows that the danger of metastases arises, not from the presence in the circulation of organisms which may lodge, but from the floating away and lodgement at other points of living carcinoma cells, and after X-rays liberate carcinoma cells they are in no condition to proliferate. My experience certainly has given no plausibility

to either of these suppositions of danger. If the danger of metastasis were increased by the treatment with X-rays, it should show in any large lists of epitheliomas treated by this method. I have had this point closely in mind. I have never seen a metastasis develop while an epithelioma was under treatment with X-rays, or afterwards, unless there was every reason to believe that metastasis was present at the time the treatment was begun. On the contrary, I have seen metastases escape on removal many times when there was much reason for them to be feared.

As to X-rays stimulating the growth of carcinomas which they cannot cure, I have seen no cases which lend weight to this hypothesis. On the contrary, I have had many cases in which the amelioration of the condition during X-ray exposures was explained away by calling attention to how frequently these cases did better than was to be expected.